

1 CLAIMS

2 1. A method, comprising:  
3 defining, by an absolute location, one or more geographical regions in  
4 which one or more fixed resources are located;  
5 defining a location of each of the one or more fixed resources within a  
6 geographical region, the location of each fixed resource being a relative location  
7 that is defined relative to the absolute location of the geographical region in which  
8 the fixed resource is located; and

9 storing the relative location of each fixed resource in a hierarchical  
10 directory structure having one or more levels corresponding to the one or more  
11 geographical regions, the relative location of each fixed resource being stored in  
12 the directory level corresponding to the geographical region from which the  
13 relative location of the fixed resource is derived.  
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15 2. The method as recited in claim 1, wherein there are multiple  
16 geographical regions, and each geographical region is defined so that all but a  
17 largest geographical region are encompassed by at least one of the other  
18 geographical regions.  
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20 3. The method as recited in claim 2, wherein each geographical region  
21 has a different size than the other geographical regions.  
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1 4. The method as recited in claim 1, wherein each of the one or more  
2 hierarchical directory levels has a class name selected from the following class  
3 names: country, state, territory, county, city, campus, building, area or floor.  
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5 5. The method as recited in claim 1, wherein the absolute location is  
6 represented by latitude and longitude coordinates.  
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8 6. The method as recited in claim 1, wherein the absolute location is  
9 represented by latitude, longitude and altitude coordinates.  
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11 7. The method as recited in claim 1, wherein the relative location is  
12 represented by linear unit coordinates in relation to a known absolute location.  
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14 8. The method as recited in claim 1, wherein the location of each of the  
15 one or more fixed resources is stored as an object with one or more properties  
16 associated with the fixed resource.  
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18 9. The method as recited in claim 1, wherein the network comprises  
19 more than one server, and the hierarchical directory structure and the information  
20 stored therein is replicated on each server in the network.  
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10. A method for searching for a location of a nearest fixed resource in a wireless network having one or more fixed resources, the method comprising:

receiving a request at a network server from a computing unit for a location of a nearest fixed resource;

determining a location of the computing unit;

searching a hierarchical directory structure containing fixed resource objects for a match with the requested fixed resource, each fixed resource object being stored in the hierarchical directory structure according to a location of each fixed resource;

determining which fixed resource object has a location that is nearest to the computing unit; and

transmitting data regarding the location of the nearest fixed resource to the computing unit.

11. The method as recited in claim 10, wherein the fixed resource objects are stored in the hierarchical directory structure according to a relative location of the fixed resource within a base geographical region in which the fixed resource is located, the base geographical region being stored in the hierarchical directory structure according to an absolute location of the base geographical region, the base geographical region being located within one or more extended geographical regions which are stored in the hierarchical directory structure according to an absolute location of each extended geographical region.

1 12. The method as recited in claim 11, wherein the searching the  
2 hierarchical directory structure further comprises beginning at a geographical  
3 region in which the computing unit is connected, searching the geographical  
4 region and, if a matching fixed resource is not found, repeatedly searching a next-  
5 largest of the one or more of the extended geographical regions until a match is  
6 found or until all the geographical regions have been searched and no match is  
7 found.

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9 13. The method as recited in claim 11, wherein the searching the  
10 hierarchical directory structure further comprises searching only a primary  
11 geographical region in which the computing unit is located and any secondary  
12 geographical regions that may be encompassed by the primary geographical  
13 region.

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15 14. The method as recited in claim 10, wherein the computing unit is a  
16 mobile computing unit operating within the scope of the wireless network.

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18 15. The method as recited in claim 10, wherein the data transmitted  
19 regarding the location of the fixed resource comprises directions from the location  
20 of the computing unit to the location of the fixed resource, the directions being  
21 displayable on the computing unit.

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23 16. The method as recited in claim 10, wherein:  
24 the request is a request for a location of a nearest fixed resource having  
25 certain properties;

1 the searching further comprises searching for a match of the requested fixed  
2 resource having the requested certain properties; and

3 the determining comprises determining which fixed resource object having  
4 the requested certain properties represents a fixed resource that is nearest to the  
5 computing unit.

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7 17. A method of storing fixed resource information about one or more  
8 fixed resources of a wireless network in one or more computer-readable media, the  
9 method comprising:

10 naming a fixed resource object with an object name that denotes a location  
11 of a fixed resource represented by the object, the fixed resource object including  
12 properties of the fixed resource; and

13 storing the fixed resource object according to the object name in a  
14 hierarchical directory structure in one or more computer-readable media, the  
15 hierarchical directory structure having multiple levels, each level representing a  
16 geographical region in which the fixed resource is located.

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18 18. The method as recited in claim 17, the hierarchical directory  
19 structure having a lowest level and a highest level, the lowest level corresponding  
20 to a smallest geographical region covered by the wireless network, the highest  
21 level corresponding to a largest geographical region covered by the wireless  
22 network.

1       19.     The method as recited in claim 17, wherein the network comprises  
2 one or more servers containing computer-readable media, and wherein the storing  
3 the object further comprises storing the object in the computer-readable media of  
4 each of the one or more servers.

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6       20.     The method as recited in claim 17, wherein the location of the fixed  
7 resource is a location that is defined relative to an absolute location.

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9       21.     The method as recited in claim 20, wherein the absolute location is a  
10 geographical region that is located within one or more other geographical regions,  
11 each geographical region corresponding to one level in the hierarchical directory  
12 structure, and wherein the object name associated with the fixed resource object  
13 comprises each geographical location in which the fixed resource is located and  
14 the relative location of the fixed resource.

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16       22.     The method as recited in claim 17, wherein there are multiple  
17 geographical regions that are divided into classes, each class corresponding to a  
18 level in the hierarchical directory structure, each geographical region belonging to  
19 one of the following classes: country, state, territory, county, city, campus,  
20 building, area or floor.

1       **23.**     The method as recited in claim 22, wherein the classes of country,  
2 state, territory, county, city, campus, building and area are stored with absolute  
3 longitudinal and latitudinal coordinates, and wherein the class of floor is stored as  
4 an altitudinal coordinate relative to the absolute coordinates of one the class of  
5 building.

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7       **24.**     A location-aware computer program, comprising:  
8       a location subsystem to determine a location of a user within at least one  
9 geographical area;

10       a resource database having records that each contain information about a  
11 resource, including a location of the resource, each record being ordered according  
12 to the location of the resource represented by the record; and

13       a query processor that receives a query from the user for a resource that is  
14 nearest to the user and returns a location of a resource that is nearest to the user.

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16       **25.**     The computer program recited in claim 24, wherein the location  
17 subsystem comprises a locator that determines a user's location.

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19       **26.**     The computer program recited in claim 24, wherein the resource  
20 database further comprises a directory tree structure having multiple levels, each  
21 level representing a geographical area.

1        27.    The computer program recited in claim 24, wherein the query  
2 processor receives the location of the user and determines which resource is  
3 nearest to the user by searching the resource database beginning with the  
4 geographical area in which the user is connected to the network and, if a resource  
5 is not found, searching at least one other geographical area for a resource matching  
6 the query.

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8        28.    The computer program recited in claim 24, wherein the location of  
9 the resource is a relative location stored with coordinates that are relative to a  
10 geographical area which is defined in absolute coordinates.

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12        29.    The computer program as recited in claim 24, wherein:  
13 the information about a resource further includes properties of the resource;  
14 and  
15 the query processor is further configured to receive a query from the user  
16 for a resource that is nearest to the user and that has at least one particular  
17 property, and to return a location of a resource that is nearest to the user and has  
18 the particular property requested by the user.

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20        30.    A wireless network system, comprising:  
21 one or more servers having non-volatile memory;  
22 at least one mobile computer located within multiple geographical areas  
23 covered by the wireless network system;  
24 at least one fixed resource located within the geographical areas, the  
25 geographical areas each having an absolute location, the fixed resource having a



1 relative location that is relative to the absolute location of a geographical area in  
2 which the fixed resource is located;

3 a location subsystem to determine the relative location of a mobile  
4 computer within a geographical area; and

5 a resource database stored in the memory of at least one of the servers, the  
6 resource database being organized in a directory tree structure having multiple  
7 levels where each of the levels corresponds to a geographical area covered by the  
8 wireless network, a highest level corresponding to a largest geographical area and  
9 a lowest level corresponding to a smallest geographical area, wherein the relative  
10 location of the fixed resource is stored at a level which represents a smallest  
11 geographical region in which the fixed resource is located.

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13 **31.** The wireless network system as recited in claim 30, wherein  
14 information regarding properties of each fixed resource is stored in the resource  
15 database together with the relative location of the fixed resource.

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17 **32.** The wireless network system as recited in claim 30, wherein the  
18 relative location of the fixed resource is stored within the lowest level of the  
19 directory tree structure.

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21 **33.** The wireless network system as recited in claim 30, wherein the  
22 fixed resource is stored in the database as a fixed resource object, the fixed  
23 resource object having a name associated with it that includes names assigned to  
24 each of the geographical regions that encompasses the fixed resource.  
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1 34. The wireless network system as recited in claim 30, wherein the  
2 fixed resource is stored in the database as a fixed resource object, the fixed  
3 resource object including properties of the fixed resource.

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5 35. The wireless network system as recited in claim 30, wherein the  
6 absolute locations are represented as longitude and latitude coordinates.

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8 36. The wireless network system as recited in claim 30, wherein the  
9 absolute locations are represented as longitude, latitude and altitude coordinates.

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11 37. The wireless network system as recited in claim 30, wherein each  
12 server is configured to:

13 receive a request from the mobile personal computer, requesting the  
14 location of a fixed resource that is nearest to the mobile personal computer;

15 determine the location of the mobile personal computer;

16 search the resource database for the location of the nearest fixed resource;

17 and

18 transmit data to the mobile personal computer containing information  
19 regarding the location of the nearest fixed resource.

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21 38. The wireless network system as recited in claim 37, wherein the data  
22 transmitted to the personal computer includes directions from the location of the  
23 mobile personal computer to the location of the nearest fixed resource.

39. The wireless network system as recited in claim 37, wherein each server is further configured to search the resource database for the location of the nearest fixed resource starting at a level in the directory tree structure that corresponds to the geographical area in which the mobile personal computer is connected, if a match is not found, continually searching a next-higher level in the directory tree structure for a match until a match is found or until all the levels have been searched and no match has been found.

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2 **40.** A database, comprising:  
3 multiple records associated with fixed resources in a wireless network; and  
4 a directory tree structure to organize the records according to a location of  
5 the fixed resource that the record represents.

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7 **41.** The database as recited in claim 40, wherein the directory tree  
8 structure comprises multiple levels, each level representing a geographical area  
9 covered by the wireless network, a lowest level representing a smallest  
10 geographical area in which a fixed resource may be located, and each  
11 subsequently higher level of the tree structure representing increasingly larger  
12 geographical areas which encompass the fixed resources.

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14 **42.** The database as recited in claim 40, wherein each record  
15 representing a fixed resource further comprises properties of the fixed resource  
16 represented by the record.

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18 **43.** One or more computer-readable media containing the database  
19 recited in claim 40.

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21 **44.** A server in a wireless network that contains the database recited in  
22 claim 40.  
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1 45. A wireless network having more than one server, wherein each of  
2 the servers contains the database recited in claim 40.

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5 AI 46. A wireless network as recited in claim 45, wherein the servers are  
6 configured to accept changes to the database and, when a change is made to the  
7 database in one server, the changed database is replicated in each of the other  
8 servers.  
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